

**Notice of Allowability**

Application No.

10/732,733

Examiner

Christopher E. Mahoney

Applicant(s)

AGOSTINELLI ET AL.

Art Unit

2851

**-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--**

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to the response filed March 10, 2006.
2. ☒ The allowed claim(s) is/are 1-88.
3. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
  - a) ☐ All    b) ☐ Some\*    c) ☐ None    of the:
  1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

\* Certified copies not received: \_\_\_\_\_.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.

**THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.**

4. ☐ A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.
5. ☐ CORRECTED DRAWINGS ( as "replacement sheets") must be submitted.
  - (a) ☐ including changes required by the Notice of Draftsperson's Patent Drawing Review ( PTO-948) attached
    - 1) ☐ hereto or 2) ☐ to Paper No./Mail Date \_\_\_\_\_.
  - (b) ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date \_\_\_\_\_.Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).
6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

**Attachment(s)**

1. ☐ Notice of References Cited (PTO-892)
2. ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3. ☐ Information Disclosure Statements (PTO-1449 or PTO/SB/08), Paper No./Mail Date \_\_\_\_\_
4. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material
5. ☐ Notice of Informal Patent Application (PTO-152)
6. ☐ Interview Summary (PTO-413), Paper No./Mail Date \_\_\_\_\_
7. ☒ Examiner's Amendment/Comment
8. ☐ Examiner's Statement of Reasons for Allowance
9. ☐ Other \_\_\_\_\_.

***Election/Restrictions***

Elected claims 1-2, 4, 5, 8-10, 12, 14, 19, 23, 63, 65, 68, 69 and 71-73 are allowable. The restriction requirement, as set forth in the Office action mailed on May 16, 2005, has been reconsidered in view of the allowability of claims to the elected invention pursuant to MPEP § 821.04(a). **The restriction requirement is hereby withdrawn as to any claim that requires all the limitations of an allowable claim.**

Additionally, all other claims have been rejoined to advance prosecution.

In view of the above noted withdrawal of the restriction requirement, applicant is advised that if any claim(s) presented in a continuation or divisional application include all the limitations of a claim that is allowable in the present application, such claims may be subject to provisional statutory and/or nonstatutory double patenting rejections over the claims of the instant application. Once a restriction requirement is withdrawn, the provisions of 35 U.S.C. 121 are no longer applicable. See *In re Ziegler*, 443 F.2d 1211, 1215, 170 USPQ 129, 131-32 (CCPA 1971). See also MPEP § 804.01.

**EXAMINER'S AMENDMENT**

An examiner's amendment to the record appears below. Should the changes and/or additions be unacceptable to applicant, an amendment may be filed as provided by 37 CFR 1.312. To ensure consideration of such an amendment, it **MUST** be submitted no later than the payment of the issue fee.

Authorization for this examiner's amendment was given in a telephone interview with Stephen Shaw on May 19, 2006.

The application has been amended as follows:

1. (Previously Presented) A display apparatus for providing a two-dimensional image on a curved display screen comprising:
  - (a) a line object generation apparatus for generating a modulated light beam, comprising:
    - (a1) a laser light source for providing an illumination beam;
    - (a2) a linear spatial light modulator for modulating the illumination beam to form the modulated light beam;
  - (b) a projection lens for directing the modulated light beam toward a line image scanner for forming a line image on the curved display and for scanning the modulated light beam to form the two-dimensional image on the curved display, wherein the line image scanner is optically disposed near center of curvature of the curved display.
2. (Original) A display apparatus according to claim 1 wherein the line object generation apparatus is disposed above the eye level of an observer.
3. (Original) A display apparatus according to claim 1 wherein the line object generation apparatus is placed below the eye level of an observer.
4. (Previously Presented) A display apparatus according to claim 1 wherein the curved display screen is a rear projection screen.
5. (Original) A display apparatus according to claim 1 wherein the linear spatial light modulator comprises an array of GEMS elements.
6. (Original) A display apparatus according to claim 1 wherein the linear spatial light modulator comprises a GLV device.

7. (Original) A display apparatus according to claim 1 wherein the linear spatial light modulator comprises a micromirror linear array.

8. (Original) A display apparatus according to claim 1 wherein the linear spatial light modulator provides the modulated light beam as at least one diffracted order of the illumination beam

9. (Original) A display apparatus according to claim 8 further comprising a spatial filter for providing the at least one diffracted order of the illumination beam.

10. (Original) A display apparatus according to claim 9 wherein the spatial filter blocks zeroeth order reflected light from the linear spatial light modulator.

11. (Original) A display apparatus according to claim 9 wherein the spatial filter blocks a non-zeroeth order diffracted light from the linear spatial light modulator.

12. (Original) A display apparatus according to claim 1 wherein the linear spatial light modulator is optically off-axis with respect to the projection lens.

13. (Original) A display apparatus according to claim 1 wherein the laser light source provides the illumination beam at a vertically oblique angle with respect to the linear spatial light modulator.

14. (Original) A display apparatus according to claim 1 wherein the laser light source provides the illumination beam at a compound oblique angle with respect to the linear spatial light modulator.

15. (Original) A display apparatus according to claim 1 wherein the line image scanner comprises a folding mirror.

16. (Original) A display apparatus according to claim 15 wherein the folding mirror is curved.

17. (Original) A display apparatus according to claim 1 wherein the line image scanner comprises a galvanometer.

18. (Original) A display apparatus according to claim 1 wherein the line image scanner comprises a rotating polygon.

19. (Original) A display apparatus according to claim 1 wherein the line image scanner comprises a rotating bigon.

20. (Original) A display apparatus according to claim 1 wherein the line image scanner employs reciprocating motion.

21. (Currently Amended) A display apparatus according to claim 1 wherein the line image scanner is optically disposed within about 30% of the radius distance from the center of curvature to the curved display ~~surface~~ screen.

22. (Currently Amended) A display apparatus according to claim 1 wherein the center of curvature of the display ~~surface~~ screen is determined using a best fit circular approximation.

23. (Previously Presented) A display apparatus according to claim 1 wherein the curved display screen is cylindrical.

24. (Currently Amended) A display apparatus according to claim 1 wherein the curved display ~~surface~~ screen is spherical.

25. (Currently Amended) A display system for providing a substantially collimated ~~virtual~~ image to a viewer, comprising:

(a) a curved mirror;

(b) a curved display ~~surface~~ screen disposed near a focal surface of the curved mirror and having a center of curvature near the center of curvature of the curved mirror for providing an intermediate image for collimation by the curved mirror;

(c) an image generation system for forming the intermediate image on the curved display ~~surface~~ screen, the image generation system comprising:

(c1) a line object generation apparatus for generating a modulated light beam, comprising:

(i) a laser light source for providing an illumination beam;

(ii) a linear spatial light modulator for modulating the illumination beam to form the modulated light beam;

(c2) a projection lens for directing the modulated light beam toward a line image scanner for forming a line image on the curved display ~~surface~~ screen and for scanning the modulated light beam to form the intermediate image as a two-dimensional image, wherein the line image scanner is optically disposed near center of curvature of the curved display ~~surface~~ screen.

26. (Original) A display apparatus according to claim 25 wherein the linear spatial light modulator comprises an array of GEMS elements.

Art Unit: 2851

27. (Original) A display apparatus according to claim 25 wherein the linear spatial light modulator comprises a GLV device.

28. (Original) A display apparatus according to claim 25 wherein the linear spatial light modulator comprises a micromirror linear array.

29. (Original) A display apparatus according to claim 25 wherein the linear spatial light modulator provides the modulated line image as at least one diffracted order of the illumination beam.

30. (Original) A display apparatus according to claim 29 further comprising a spatial filter for providing the at least one diffracted order of the illumination beam.

31. (Original) A display apparatus according to claim 30 wherein the spatial filter blocks zeroth order reflected light from the linear spatial light modulator.

32. (Original) A display apparatus according to claim 30 wherein the spatial filter blocks non-zero order diffracted light from the linear spatial light modulator.

33. (Original) A display apparatus according to claim 25 wherein the linear spatial light modulator is optically off-axis with respect to the projection lens.

34. (Original) A display apparatus according to claim 25 wherein the laser light source provides the illumination beam at a vertically oblique angle with respect to the linear spatial light modulator.

Art Unit: 2851

35. (Original) A display apparatus according to claim 25 wherein the laser light source provides the illumination beam at a compound oblique angle with respect to the linear spatial light modulator.

36. (Original) A display apparatus according to claim 25 wherein the line image scanner comprises a folding mirror.

37. (Original) A display apparatus according to claim 36 wherein the folding mirror is curved.

38. (Original) A display apparatus according to claim 25 wherein the line image scanner comprises a galvanometer.

39. (Original) A display apparatus according to claim 25 wherein the line image scanner comprises a rotating polygon.

40. (Original) A display apparatus according to claim 25 wherein the line image scanner comprises a rotating bigon.

41. (Original) A display apparatus according to claim 25 wherein the line image scanner employs reciprocating motion.

42. (Currently Amended) A display apparatus according to claim 25 wherein the line image scanner is optically disposed within about 30% of the radius distance from the center of curvature to the curved display ~~surface~~ screen.

43. (Currently Amended) A display apparatus for providing a two-dimensional image on a display surface comprising:



Art Unit: 2851

(a) a line object generation apparatus for generating a modulated light beam, comprising a laser light source for providing an illumination beam at a compound oblique angle to a linear spatial light modulator for modulating the illumination beam to form the modulated light beam; and

(b) a projection lens for directing the modulated light beam toward a line image scanner for forming a line image on the display surface and for scanning the modulated light beam to form the two-dimensional image on the display ~~surface~~ screen.

44. (Currently Amended) A display apparatus for providing a two-dimensional image on a display surface comprising:

(a) a line object generation apparatus for generating a modulated light beam, comprising a laser light source for providing an illumination beam at a vertical oblique angle to a linear spatial light modulator for modulating the illumination beam to form the modulated light beam;

(b) a projection lens for directing the modulated light beam toward a line image scanner for forming a line image on the display surface and for scanning the modulated light beam to form the two-dimensional image on the display ~~surface~~ screen.

45. (Original) A display apparatus according to claim 43 wherein the linear spatial light modulator is optically off-axis relative to the projection lens.

46. (Original) A display apparatus according to claim 44 wherein the linear spatial light modulator is optically off-axis relative to the projection lens.

47. (Original) A display apparatus according to claim 43 wherein the linear spatial light modulator comprises an array of GEMS elements.

Art Unit: 2851

48. (Original) A display apparatus according to claim 43 wherein the linear spatial light modulator comprises a GLV device.

49. (Original) A display apparatus according to claim 43 wherein the linear spatial light modulator comprises a micromirror linear array.

50. (Original) A display apparatus according to claim 43 wherein the linear spatial light modulator provides the modulated light beam as at least one diffracted order of the illumination beam

51. (Original) A display apparatus according to claim 50 further comprising a spatial filter for providing the at least one diffracted order of the illumination beam.

52. (Original) A display apparatus according to claim 51 wherein the spatial filter blocks zeroeth order reflected light from the linear spatial light modulator.

53. (Original) A display apparatus according to claim 51 wherein the spatial filter blocks a non-zeroeth order diffracted light from the linear spatial light modulator.

54. (Original) A display apparatus according to claim 43 wherein the line image scanner comprises a folding mirror.

55. (Original) A display apparatus according to claim 44 wherein the linear spatial light modulator comprises an array of GEMS elements.

56. (Original) A display apparatus according to claim 44 wherein the linear spatial light modulator comprises a GLV device.

57. (Original) A display apparatus according to claim 44 wherein the linear spatial light modulator comprises a micromirror linear array.

58. (Original) A display apparatus according to claim 44 wherein the linear spatial light modulator provides the modulated light beam as at least one diffracted order of the illumination beam.

59. (Original) A display apparatus according to claim 58 further comprising a spatial filter for selecting the at least one diffracted order of the illumination beam.

60. (Original) A display apparatus according to claim 59 wherein the spatial filter blocks zeroeth order reflected light from the linear spatial light modulator.

61. (Original) A display apparatus according to claim 59 wherein the spatial filter blocks a non-zeroeth order diffracted light from the linear spatial light modulator.

62. (Original) A display apparatus according to claim 44 wherein the wherein the line image scanner comprises a folding mirror.

63. (Previously Presented) A method for providing an image on a curved display screen comprising:

(a) generating a modulated light beam by directing a laser illumination beam to a linear spatial light modulator and modulating the spatial light modulator to form a line object thereon;

(b) providing a line image scanner optically disposed near the center of curvature of the curved display screen; and,

(c) projecting the modulated light beam toward the line image scanner to form a line image on the curved display screen and scanning the modulated light beam to form a two-dimensional image on the curved display screen.

64. (Currently Amended) A method for providing an image on a curved display ~~surface~~ screen according to claim 63 wherein the laser illumination beam is directed toward the linear spatial light modulator at a vertically oblique angle.

65. (Previously Presented) A method for providing an image on a curved display screen according to claim 63 wherein the laser illumination beam is directed toward the linear spatial light modulator at a compound oblique angle.

66. (Currently Amended) A method for providing an image on a curved display ~~surface~~ screen according to claim 63 wherein the step of projecting the modulated light beam toward the line image scanner comprises the step of directing the modulated light beam toward a galvanometer mirror.

67. (Currently Amended) A method for providing an image on a curved display ~~surface~~ screen according to claim 63 wherein the step of projecting the modulated light beam toward the line image scanner comprises the step of directing the modulated light beam toward a rotating polygon.

68. (Previously Presented) A method for providing an image on a curved display screen according to claim 63 wherein the step of projecting the modulated light beam toward the line image scanner comprises the step of directing the modulated light beam toward a rotating bigon.

69. (Previously Presented) A method for providing an image on a curved display screen according to claim 63 wherein the step of directing the

Art Unit: 2851

laser illumination beam to the linear spatial light modulator comprises the step of directing the laser illumination beam to an array of GEMS elements.

70. (Currently Amended) A method for providing an image on a curved display ~~surface~~ screen according to claim 63 wherein the step of directing the laser illumination beam to the linear spatial light modulator comprises the step of directing the laser illumination beam to a GLV device.

71. (Previously Presented) A method for providing an image on a curved display screen according to claim 63 wherein the step of generating a modulated light beam comprises the step of blocking at least one diffracted order of light modulated at the spatial light modulator.

72. (Previously Presented) A method for providing an image on a curved display screen according to claim 71 wherein the step of blocking the at least one diffracted order of light modulated at the spatial light modulator comprises the step of blocking a zeroeth order light.

73. (Previously Presented) A method for providing an image on a curved display screen according to claim 63 wherein the line image scanner is a rotating scanner.

74. (Currently Amended) A method for providing an image on a curved display ~~surface~~ screen according to claim 63 wherein the line image scanner is a reciprocating scanner.

75. (Currently Amended) A method for providing an image on a curved display ~~surface~~ screen according to claim 63 wherein the step of providing a line image scanner optically disposed near the center of curvature of the curved display comprises the step of providing a line image scanner optically disposed

Art Unit: 2851

within about 30% of the radius from the center of curvature to the curved display ~~surface~~  
screen.

76. (Previously Presented) A method for providing an image on a curved display screen comprising:

(a) generating a modulated line object by modulating a laser illumination beam, the modulated line object is off-axis from a projection lens;

(b) imaging the modulated line object through the projection lens toward a line image scanner, wherein the line image scanner is optically disposed near the center of curvature of the curved display screen.

77. (Previously Presented) A method for providing an image on a curved display screen according to claim 76 wherein the line image scanner is off-axis from the projection lens.

78. (Previously Presented) A method for providing an image on a curved display according to claim 76 wherein the step of modulating a laser illumination beam comprises the step of modulating an array of GEMS elements.

79. (Currently Amended) A method for providing an image on a curved display ~~surface~~ screen according to claim 76 wherein the step of modulating a laser illumination beam comprises the step of modulating a GLV device.

80. (Currently Amended) A method for providing an image on a curved display ~~surface~~ screen according to claim 76 wherein the step of modulating a laser illumination beam comprises the step of modulating a micromirror linear array.

81. (Previously Presented) A method for providing an image on a curved display screen according to claim 76 wherein the step of imaging the

Art Unit: 2851

modulated line object comprises the step of blocking at least one diffracted order of light from the laser illumination beam.

82. (Currently Amended) A method for providing an image on a curved display ~~surface~~ screen according to claim 76 wherein the step of modulating a laser illumination beam comprises the step of modulating a vertically oblique laser illumination beam.

83. (Previously Presented) A method for providing an image on a curved display screen according to claim 76 wherein the step of modulating a laser illumination beam comprises the step of modulating a compound oblique laser illumination beam.

84. (Previously Presented) A method for providing an image on a curved display screen according to claim 76 wherein the line image scanner is a rotating scanner.

85. (Currently Amended) A method for providing an image on a curved display ~~surface~~ screen according to claim 76 wherein the line image scanner is a reciprocating scanner.

86. (Withdrawn) A method for providing an image on a curved display ~~surface~~ screen according to claim 76 wherein the line image scanner is optically disposed within about 30% of the radius from the center of curvature to the curved display surface.

87. (Previously Presented) A method for displaying a two-dimensional image on a display screen comprising:

Art Unit: 2851

(a) providing an illumination beam at a compound oblique angle to a linear spatial light modulator for modulating the illumination beam to form a modulated light beam;

(b) projecting the modulated light beam toward a line image scanner for forming a line image on the display screen and scanning the modulated light beam to form the two-dimensional image on the display screen.

88. (Currently Amended) A method for displaying a two-dimensional image on a display ~~surface~~ screen comprising:

(a) providing an illumination beam at a vertical oblique angle to a linear spatial light modulator for modulating the illumination beam to form a modulated light beam;

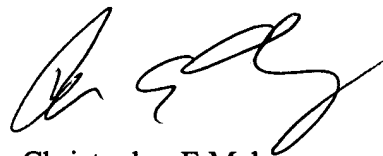
(b) projecting the modulated light beam toward a line image scanner for forming a line image on the display surface and scanning the modulated light beam to form the two-dimensional image on the display ~~surface~~ screen.



Any inquiry concerning this communication or earlier communications from the examiner should be directed to Christopher E. Mahoney whose telephone number is (571) 272-2122. The examiner can normally be reached on 8:30AM-5PM, Monday-Thursday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Judy Nguyen can be reached on (571) 272-2258. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

A handwritten signature in black ink, appearing to read 'C. Mahoney', is positioned above the printed name.

Christopher E Mahoney  
Primary Examiner  
Art Unit 2851